



Novel materials for more robust solid oxide fuel cells in small scale applications

Holtappels, Peter

Publication date:
2017

Document Version
Publisher's PDF, also known as Version of record

[Link back to DTU Orbit](#)

Citation (APA):

Holtappels, P. (2017). *Novel materials for more robust solid oxide fuel cells in small scale applications*. Abstract from 26th International Materials Research Congress (IMRC 2017), Cancún, Mexico. https://www.mrs-mexico.org.mx/imrc2017/app_abstract-pdf.php?id_res=02915

General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

NOVEL MATERIALS FOR MORE ROBUST SOLID OXIDE FUEL CELLS IN SMALL SCALE APPLICATIONS

Peter Holtappels¹

¹Department of Energy Conversion and Storage, Technical University of Denmark. Frederiksborgvej 399, DK-4000 Roskilde, Denmark.

Solid oxide fuel cells can offer supply of electrical energy with a high efficiency and based on a wide range of fuels. While natural gas and/or bio methane is a commonly used fuel for combined heat and power supply, liquid fuels such as gasoline, Diesel and alcohols are interesting fuels, especially for remote fuel cell systems. For those applications, redox tolerant and Sulphur resistant fuel electrode materials are advantageous in order to make the cells more tolerant against sudden system failures such as fuel cut off and reformer breakdown. Also for direct feeding of alcohols and higher hydrocarbons, coking tolerant electrodes are required. State-of art fuel electrodes are based on a nickel ceramic composite, a nickel cermet, which suffers from low redox stability, susceptibility for sulfur poisoning and coking. Redox stable anodes can be achieved by replacing the Ni-cermet fuel electrode by an electronically conducting ceramic, e.g. strontium titanate with incorporated nano-scaled electro catalysts. Full cells using LSM/YSZ cathodes have been developed and tested as single 5 x 5 cm² cells and up 100 cm² circular cells. The initial performance exceeded 0.4 W/cm² at 850 °C and redox tolerance has been proven in a 1 kW system environment. The cell concept provides flexibility with respect to the used electro-catalysts and various metals including Ni and Ru infiltrated in a niobium modified strontium titanate have been studied as regards their electrochemical performance and stability. Stable power output has been observed for Ru and Ru/Gd modified ceria (CGO) as infiltrate. The stability of the nano scaled electro catalysts depends on the materials combinations and the role of the possible catalyst-support interactions will be discussed.

Keywords: Solid oxide fuel cells, ceramic anodes, redox tolerance

Presenting author's email: peho@dtu.dk